AESS and Other Emission Reduction Strategies

for

Air Resource Board

April 25, 2006

ELECTRO-MOTIVE

Talking Points

- Automatic Engine Start Stop (AESS)
  - Basic Functionality
  - Impact on Emissions
  - Recent Improvements
- Other Emissions Efforts
  - Emissions Kits

AESS Basic Functionality

AESS monitors six (6) conditions and will allow the engine to shutdown if:

- **Engine coolant temperature**
- **Locomotive battery charging rate**
- **Locomotive battery voltage**
- **Independent Brakes are applied**
- **Reverser handle is centered (throttle in idle)**
- **Outside ambient air temperature (Optional)**

Conversely, AESS will restart the engine if:

- **Engine coolant temperature**
- **Locomotive Battery voltage**
- **Main Reservoir pressure**
- **Reverser handle is moved to either 'Forward' or 'Reverse'**
- **Outside ambient air temperature (Optional)**

AESS will allow a unit to be shutdown up to 47 hours before restart is required

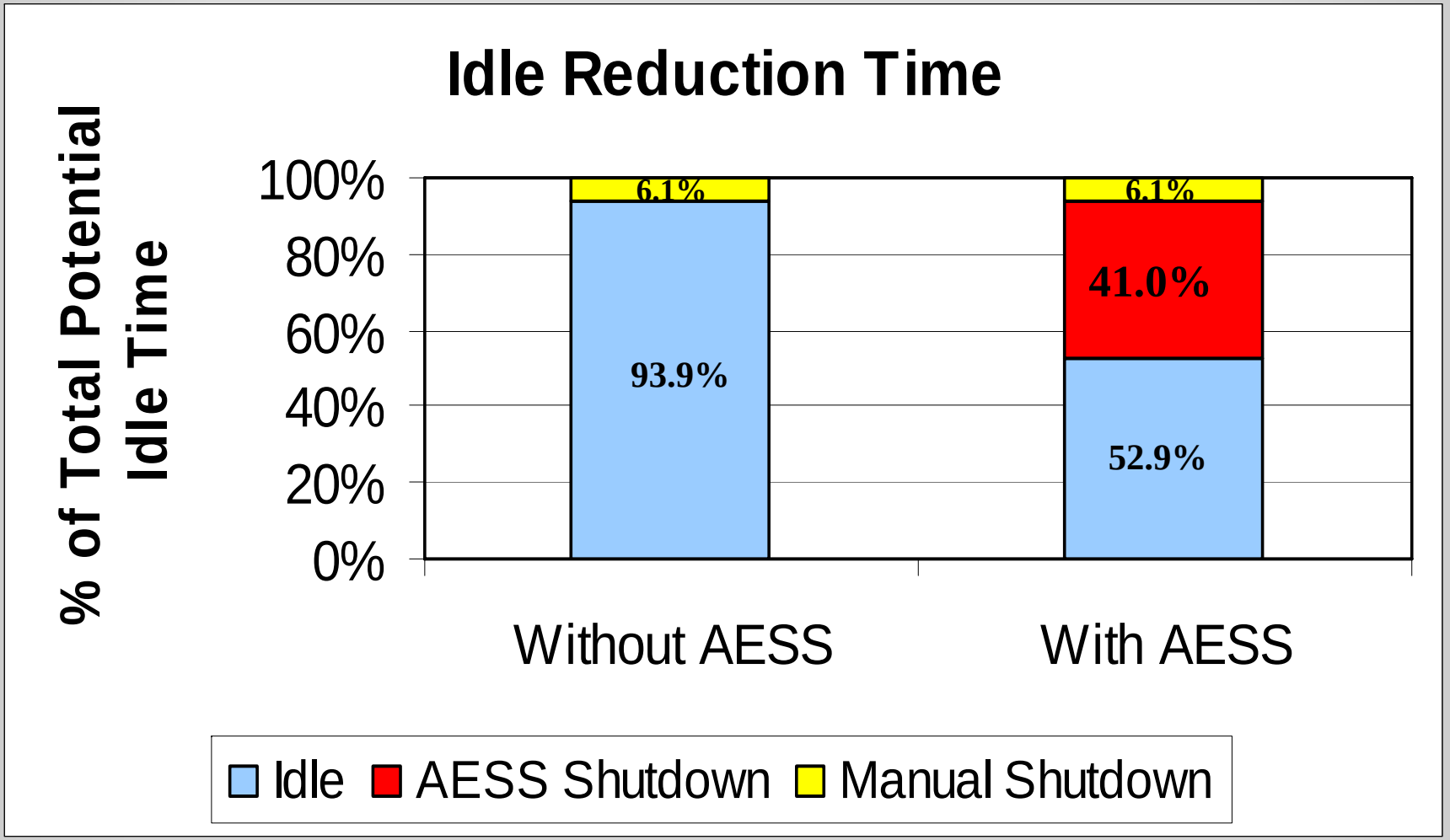
AESS Impact on Emissions

- This AESS operating data analysis uses the following terms:
  - **Idle Reduction Time** = AESS Shutdowns + Manual Shutdowns
  - **Actual Idle Time** = EM2000 Blocked Shutdowns + Operator Blocked Shutdowns
  - **Total Potential Idle Time** = Actual Idle Time + Idle Reduction Time

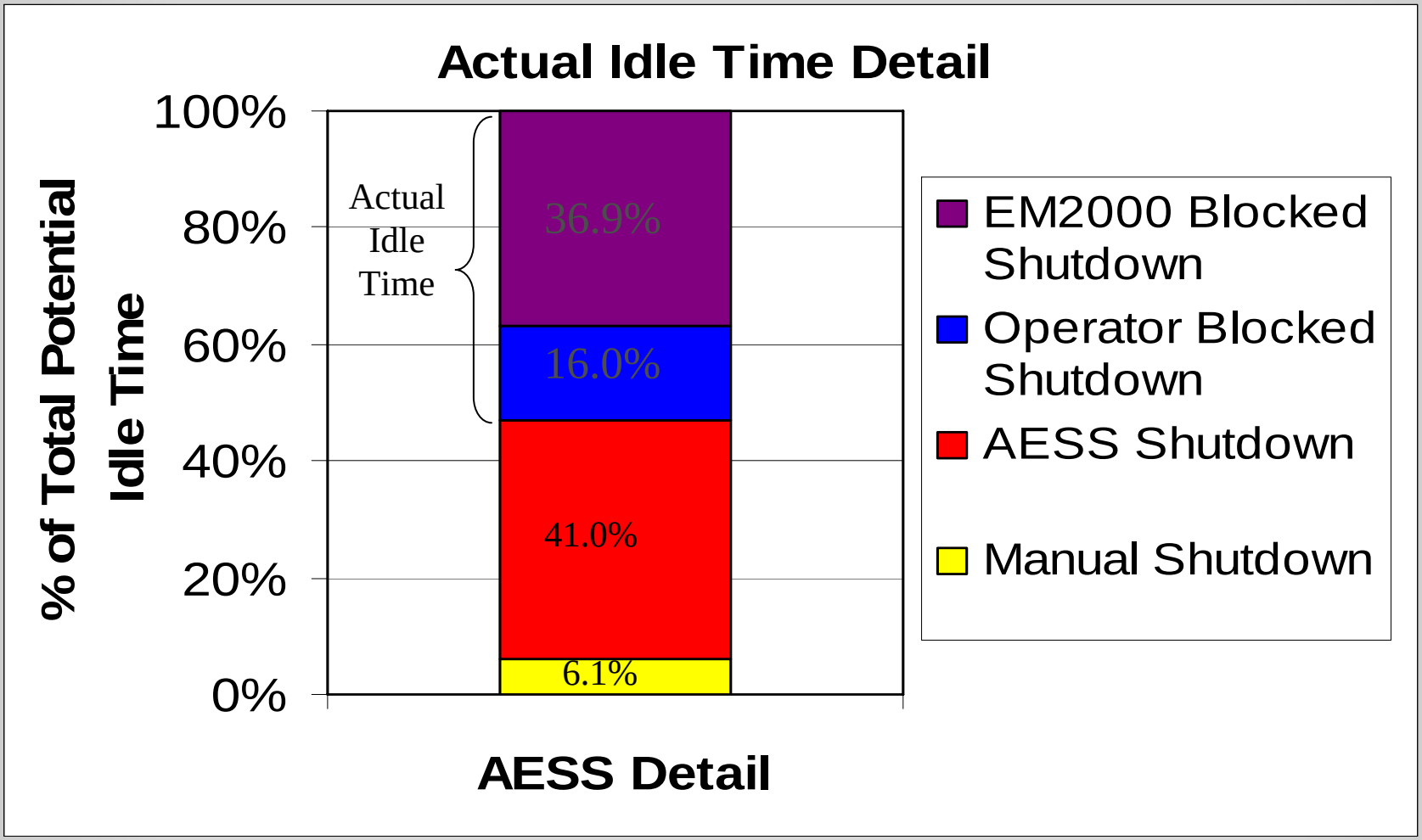
AESS Impact on Emissions

- Data for the following Slides
  - Data gathered from November 2002 to April 2003 because the winter is where AESS is least effective
  - Data represents 5962 locomotive days of operation
  - Results are operation / duty cycle and season dependent

AESS Impact on Emissions



AESS Impact on Emissions

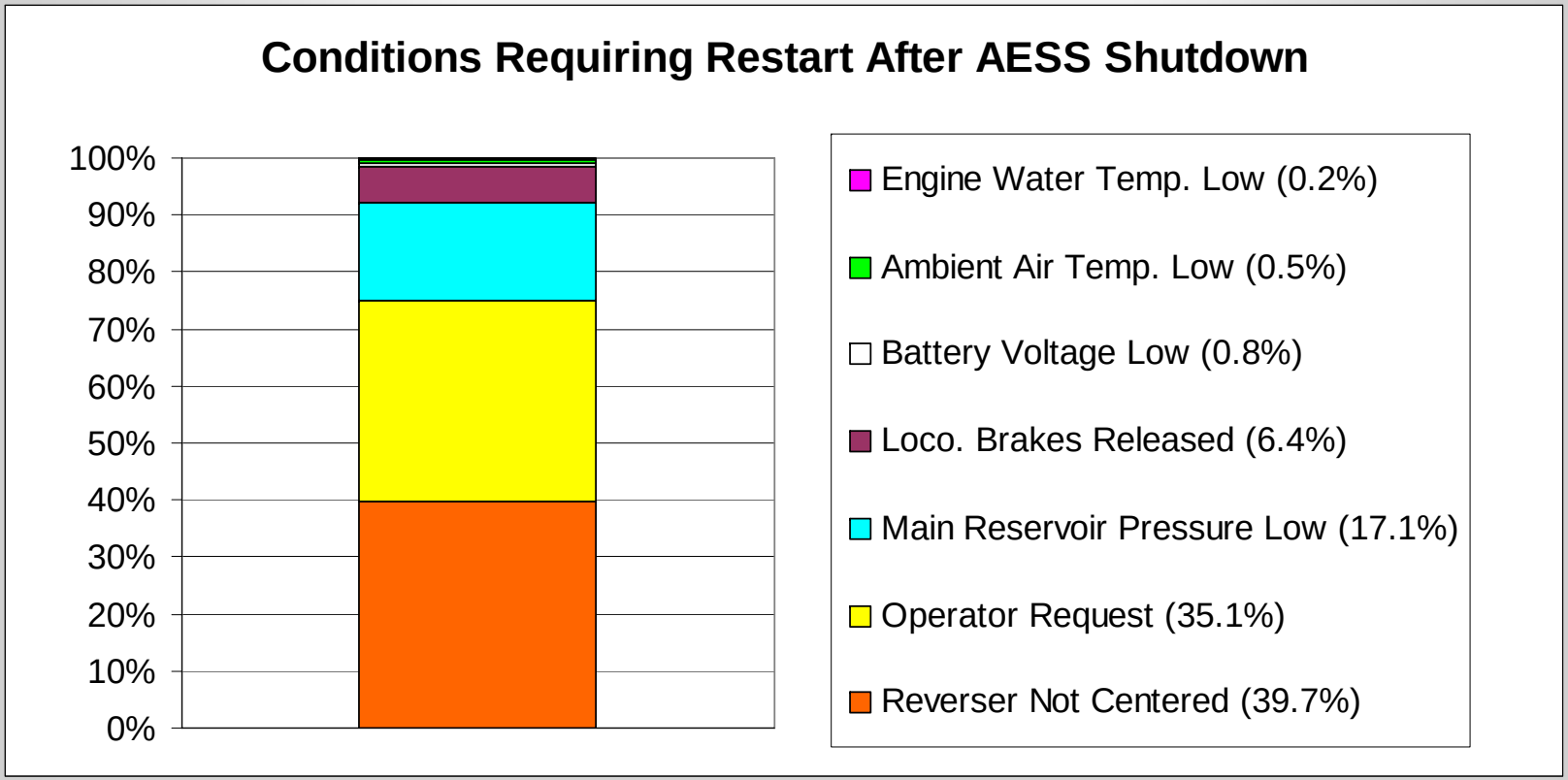


AESS Impact on Emissions

- **Summary of Impact of AESS**
  - **Reduced Noise**
  - **Reduced Emissions**
    - **NOx: Roughly 1 ton per year per locomotive**
    - **PM: Roughly .02 tons per year per locomotive**
- **Things to Consider**
  - **Multiple Unit Effects**
  - **Actual calculations are difficult due to variability at IDLE**

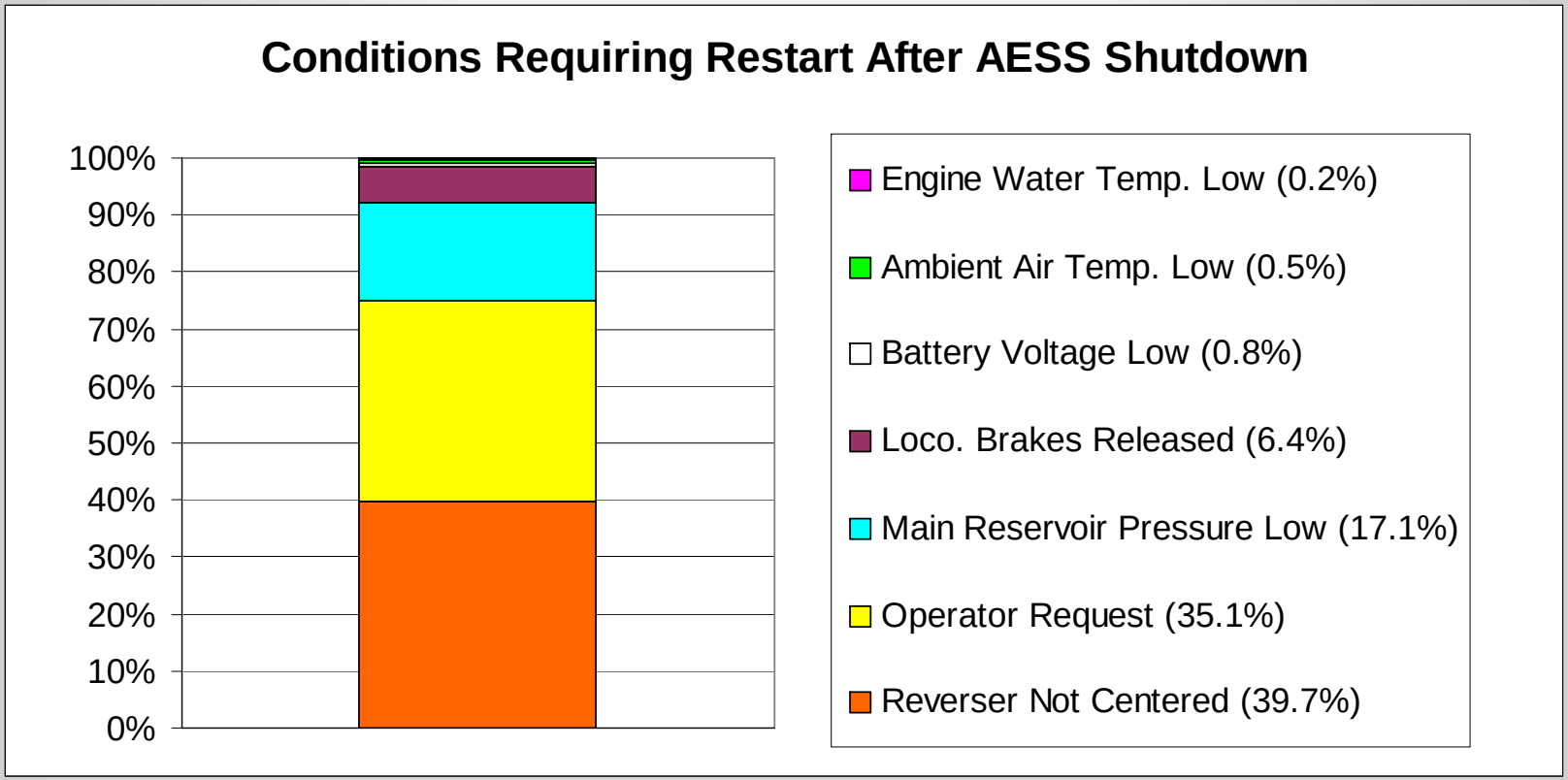
AESS Recent Improvements

- Use Main Reservoir 2 instead of Main Reservoir 1



AESS Recent Improvements

- Alarm for Crews when Disabled



AESS Recent Improvements

- Mechanical Units with EM2000
  - On Algeria order
  - Imitate EMDEC function for coolant pressure shutdown within EM2000

Emission Kits

- Post 1973 Emissions Kits
  - Completed and currently being applied to locomotives at overhaul
  - 1/3 Reduction in NOx Emissions
- Pre 1973 Emissions Kits
  - Still under development
  - Expected 1/3 Reduction in NOx Emissions